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By-Steinberg, Danny D.

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The findings reported in this paper are the result of an experiment to determine the empirical validity of such semantic concepts as analytic, synthetic, and contradictory. Twenty-eight university students were presented with 156 sentences to assign to one of four semantic categories: (1) synthetic ("The dog is a poodle"), (2) analytic ("The tulip is a flower"), (3) contradictory ("The infant is an adult"), and (4) amphiguous or nonsensical ("The moon is a newspaper"). A word sort was administered to a different group of 15 subjects in order to determine in a relatively direct way the principle semantic features which underlie the 13 lexical items used in the experimental sentences. The word sort provided data which supports the contention that the dimensions of "animateness," "humanness," "sex," "marriage," and "engage" are ones which underlie the lexical items in question. The sentence results provided evidence which supports a distinction between the informative (synthetic), redundant (analytic), contradictory, and amphiguous semantic categories. The author proposes a criterion for each of these semantic types based on such notions as semantic features, a hierarchy of semantic features, and rules of semantic interaction. (DO)

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Danny D. Steinberg

Institute of Communications Research

The University of Illinois

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Danny Steinberg
Institute of Communications Research
The University of Illinois

INTRODUCTION

The investigation to be described in this paper was prompted by an interest in a recent philosophical controversy concerning the analytic-synthetic distinction, a problem with a long history in modern philosophy. Those making the distinction (Carnap, 1950, for example) generally hold that a sentence is called analytic if it is true on the basis of logical rules alone, contradictory (the other side of the analytic coin) if false on the basis of logical rules alone, and synthetic if it is neither analytic nor contradictory, i.e., that its truth or falsehood cannot be determined by logic alone but needs reference to facts outside of language. Sentences such as S1) No unmarried man is married, and S2) No bachelor is married, are viewed as analytic. In Quine's view, these two sentences typify two classes of analyticity. The first remains true under any and all reinterpretation of its components (excluding the logical particles), "man" and "married". One must suppose, of course, a prior inventory of such logical particles as "no", "un-", "not", "if", and "then". However, in order to reduce the analytic sentence of the second class to that of the first so that it, too, can be termed a logical truth requires an additional notion, like synonymy, which would permit us to replace "bachelor" with "unmarried man". According to Quine, it is sheer unempirical dogma to hold that S2 can be turned to S1 and hence a logical truth since "We still lack a proper characterization of this second class of analytic statements, and therewith of analyticity generally, inasmuch as we have had in the above description to lean on a notion of "synonymy" which is no less in need of clarification than analyticity itself." (Quine, 1953, p. 198). Grice and Strawson (1956) on the other hand, feel that Quine's thesis is extreme and they have argued that there is a strong presumption in favor of the analytic-

synthetic distinction and that this presumption is not in the least shaken by the fact (if it is a fact) that the distinctions in question have not been in some sense, adequately clarified.

In an attempt to provide a characterization of the analytic-synthetic distinction, Katz (1964) proposed a solution to the problem posed by Quine based on his semantic theory. Utilizing such theoretical constructs as dictionary entries, semantic markers, and projection rules, Katz defined analytic, contradictory and synthetic sentences. In a recent book Katz (1966) proposed essentially the same analytic definitions as those of his earlier work. Analyticity is regarded as the case where truth is necessary because meaning of the subject includes the concepts (semantic markers) expressed in the predicate. Katz later recognized (Katz, 1967), that his proposal, which he derives from Kant, did not fall within the scope of the particular analyticity notion which Carnap and other logical positivists were concerned (Quine, 1960). Katz, too, joined Quine in criticizing the positivistic notion.

Both Katz and Quine agree that any satisfactory version of analyticity would have to carry with it some approximate behavioral criteria (Quine, 1967 and Katz, 1968). The extent of even this modicum of agreement remains to be seen since in Katz's view, "I regard behavioral tests as indispensable, but I regard them as indispensable for <u>testing</u> the empirical adequacy of definitions of theoretical terms such as that of analyticity. Quine, on the other hand, regards them as indispensable for <u>defining</u> theoretical terms." (Katz, 1968, p. 31).

Katz suggests a test in which subjects are asked to sort sentences into categories (Katz, 1967). Each category would contain a number of sentences which are clear cases of a certain postulated category. One category might contain examples of analytic sentences, another contradictory ones, another synthetic ones, etc. In order to guard against possible circularity, the data were to be collected without the experimenter having to resort to a linguistic description of the categories in question. Katz states that, "Positive results in this

experiment can be interpreted to mean that the judgments of the speakers reflect a recognition of the analyticity of the sentences concerned. We can say, then, that our definition of analyticity, which enabled us to predict the outcome of the experiment, describes the concept of analyticity employed by the speakers as their implicit criterion for identifying analytic sentences... We can say this on the grounds that assuming that this is their criterion provides us with the best explanation of the behavioral data obtained in the experiment." (p. 50, 51)

The findings to be reported in this paper are the result of an experiment similar to the one which Katz suggested. Its primary purpose, essentially the same as Katz's, is to determine the empirical validity of such concepts as analytic, synthetic, and contradictory. In the event that the concepts are shown to be empirically valid, this investigation will attempt to provide a criterion with which one may account for such an outcome. Such an explanation would utilize such notions as semantic features and that of a semantic feature hierarchy.

METHOD

Subjects. The subjects (Ss) were 43 students, mostly freshmen, who were enrolled in an introductory psychology course at the University of Illinois. They ranged in age from 17 to 22 years.

Semantic Rating of Sentences. Sentences were presented to Ss for rating. The sentences were printed in a booklet. Each sentence was to be assigned (by a checkmark in the proper column) to one of four semantic categories by the S. The complete instructions were as follows:

> You will be presented a number of sentences. They are 4 different types. You are to rate each one as type 1, 2, 3, or 4.
>
> Here are some type 1 sentence examples:
>
> The dog is a poodle. 1. _____
>
> The tailor is an expert. _____
>
> The insect is an ant.

The fish is a trout.

The thief is a barber.

Here are some type 2 sentence examples:

The tulip is a flower. 2. _____

The elm is a tree. _____

The carrot is a vegetable.

The automobile is a vehicle.

The apple is a fruit.

Here are some type 3 sentence examples:

The infant is an adult. 3. _____

The friend is a foe. _____

The dog is a cat.

The solid is a liquid.

The hand is a foot.

Here are some type 4 sentence examples:

The moon is a newspaper. 4. _____

The bookcase is a brush. _____

The mountain is a frog.

The dust is a plant.

The gymnasium is a cloud.

Study each of the sentences of the 4 types. Try to distinguish one type clearly from another. It will be useful to write down a word or two which would describe each type.

When judging the sentences, please only use the literal meanings of the words and not any metaphorical meanings.

Type 1 examples are meant to represent synthetic sentences, Type 2, analytic sentences, Type 3, contradictory sentences, and Type 4 amphigorous or nonsensical sentences. The latter category, amphigorous is one which this writer hypothesizes to be distinct from the others, although somewhat related to that of contradiction. In the present study, the terms Informative, Redundant, and Contradictory will be used instead of the traditional set of synthetic, analytic, and contradictory, since by them I wish to signal a particular explanation of analyticity.

This view which I shall later detail is similar to one suggested by Katz (1964), and is based on an information or semantic content approach. Analyticity is regarded, for example, as the failure of a predicate to provide new information about the subject, as in The husband is a man, or, for example, the failure of a modifier to provide new information about a head noun, as in married husband. In the present investigation, the unit of information is the coded semantic feature. With other types of lexical items or contrasts the semantic feature construct may not be adequate to provide an appropriate characterization of information or semantic content (see Bolinger, 1965), for example).

The sentences presented to the Ss for rating were constructed using the frame, "The _____ is a _____." Thirteen different lexical items were inserted in the blanks. These lexical items were: man, woman, person, husband, wife, spouse, fiance, fiancee, betrothed, ram, ewe, sheep and chair. In order to make certain that the meaning of the less familiar items was clear to all Ss, six items were glossed as follows: ewe: a female sheep; ram: a male sheep; spouse: a person who is married; betrothed: a person who is engaged to be married; fiance: a male person who is engaged; and fiancee: a female person who is engaged to be married. The lexical items were selected by this investigator on an intuitive basis in order to yield a variety of similarities and contrasts with respect to underlying semantic features or components.

Semantic features were postulated which would distinguish each of the lexical items from one another. Certain of the features enter into antithetical relationships with certain other features and form what may be called a semantic dimension. These dimensions and their features are: ANIMATENESS, Animate-Inanimate; HUMANNESS: Human-Animal; SEX: Male-Female; MARRIAGE: Married-Single; and ENGAGE: Engaged-Unengaged. The features of a dimension are at once complementary and conflicting. They are complementary in that all features together wholly specify the dimension; they are conflicting in that the assertion of one feature implies the denial of the other

(or others as the case may be) which comprises that dimension. For example, the features Male and Female comprise (wholly, I believe) the dimension SEX. The assertion of the feature Male implies the denial of the feature Female and vice versa.

The 13 lexical items were paired with one another in all possible combinations with the exception of the 13 cases of identity where the two lexical items of a pair are the same. A total of 156 different combination pairs was obtained. The lexical items of each pair were placed in the frame, The _____ is a _____. The first lexical item of a pair was placed in the first blank, the second of the pair in the second blank. A total of 156 sentences were thus constructed in this way. Since each pair of lexical items occurs in two orders, e.g., The man is a fiance, and The fiance is a man, the effects of reversing the relations between items may be studied. The 13 cases of identical pairs were not included in the study since it was felt that given an example, the identification of such cases would be obvious.

The sentences were presented to 28 Ss for rating, and each S rated all of the 156 sentences. The sentences were arranged in a random order in the booklet. The Ss completed the task in 1¼ hours or less. No time limit had been set.

Semantic Word Sort. In order to determine in a relatively direct way the principal semantic features which underlie the 13 lexical items a modified version of an objective technique, the Word Sort, was administered to a different group os Ss. These 15 Ss rated the same 156 sentences as the 28 Ss above before they were administered the Word Sort. (The sentence results for these 15 Ss will not be reported in this paper since those data were collected using a different set of instructions and they have yet to be analyzed.) The instrument, which had been devised by this investigator (Steinberg, 1967) is in the form of a word game in which individual Ss are instructed to arrange words into groups according to meaningful characteristics of their own choosing.

Each S was provided with 13 small pieces of paper with a lexical item printed on each. A dozen sheets of paper, each called a "Sort

Sheet," were also provided. The Sort Sheet was sectioned off into four quarters so as to provide four bins in which the Ss could sort the lexical items (small pieces of paper). Each bin represented a semantic feature. The Sort Sheet appeared like this:

BIN 1 Feature_____

BIN 2 Feature is contradictory or antonymous with respect to Bin 1 Feature

(a)_____ (b) _____ (c) _____

BIN 3 Either Bin 1 Feature or Bin 2 Feature (a, b, or c)

BIN 4 Neither Bin 1 Feature nor Bin 2 Feature

The S was instructed to look at the 13 lexical items spread before him and to think of a meaningful feature or characteristic which may be attributed to one or more of the items. He was to write a description of the feature which he selected on the line provided next to BIN 1 of the Sort Sheet. For BIN 2, he was then to think of a feature which was contradictory or antonymous to that feature which he recorded for BIN 1. In the event he could think of more than one such feature, he was to list them as a, b, or c. If he could not think of a feature he was not required to write anything. Each of the 13 items was then sorted into one of the four bins. (There was a large space for each bin.) When the sorting was completed, the S recorded his choices by writing in each of the bin spaces. When this was done, the S then picked up the 13 items, turned over to a fresh Sort Sheet and began the procedure all over again by thinking of a different meaningful feature.

A practice sort was first presented. Ss were asked to sort the four lexical items rain, sponge, dust and democracy. When all had finished, the experimenter (E) presented his solution: BIN 1 Feature: WET, and BIN 2 Feature: (a) DRY. The lexical item rain was placed in BIN 1, dust in BIN 2, sponge in BIN 3 and democracy in BIN 4. The E briefly discussed his solution and answered any questions before the Ss were started on the task. No time limit was set.

RESULTS

The Word Sort data will be presented first since classifications based on these findings will be used in presenting the sentence results.

Word Sort Results. The 15 Ss produced a total of 132 sorts. The number of sorts per S ranged from 7 to 13 with a median of 8. The sorts were inspected and classified with respect to the five postulated semantic dimensions of 1) ANIMATENESS: Animate-Inanimate, 2) HUMANNESS: Human-Animal, 3) SEX: Male-Female, 4) MARRIAGE: Married-Single, and 5) ENGAGE: Engaged-Unengaged. The outcome of classifying Ss' sorts on the basis of these dimensions is shown in Table 1. In two cases where

Table 1 goes here

Ss made a trinary classification (Ss 14 and 15), two dimensions were credited.

In reading the table, subject number 1 did 4 sorts which pertained to the postulated features and he labelled them (BINS 1 and 2 on his Sort Sheets) as "mobile-stationery", "human-unhuman", "male-female", and "married-unmarried." This S also did 5 other sorts (for a total of 9) but these are not presented in the table. It should be noted that the labels recorded in the table are precisely those which the Ss had written down. Some of the Ss' feature labels which closely correlate with those of the postulated features have been accepted, e.g., "fleshlike-wooden" for Animate-Inanimate. Since such a procedure is of doubtful validity, only a few such cases were allowed.

Most of the Ss produced features for HUMANNESS (13/15), SEX (14/15), and MARRIAGE (14/15). A majority of the Ss gave the features for ANIMATENESS (10/15), and ENGAGE (8/15). In all, the five postulated dimensions accounted for 59 out of the total of 132 sorts which is 44.7% of all sorts produced. Among the remaining sorts there was, except for one case, little definite feature commonality. Such diverse features as "motherly-harsh", "2 arms-no arms", "homemaker-wageowner" (sic), "rhyme w/hair-rhymes with mail", "band of gold-already has band", "male supporter-female dependent", "tail-no tail", "says "baa"- speaks

language", "hoof-toes", "horned-hornless", "more than 3 legs-less than 3 legs", "3 letter words-5 letter words", and "first human-all other humans" were among those offered by the Ss. The one dimension upon which 10 of the Ss agreed was "four legs-two legs", with chair sorted together with sheep, ram and ewe under "four legs".

A summary table of feature codings for the 13 lexical items based on the Word Sort results is shown in Table 2. (Please disregard the

Table 2 goes here

items below fiancee until later.) Each row presents the feature codings for a lexical item. The + or the - indicates a specific coding for the feature in question. For example, the + for sheep on ANIMATENESS indicates that it is Animate while the - for chair on ANIMATENESS indicates that it is Inanimate. The assignment of +'s or -'s is based on a majority of the Ss labelling and sorting for Bins 1 and 2 in the Word Sort (the feature of Bin 1 to be antonymous to that of the feature of Bin 2). The v indicates that the lexical item is coded with either + or -. For example, sheep is marked v on SEX which indicates that the lexical item is not definite in specifying a Male or a Female coding. The assignment of v's is based on Ss performance with respect to Bin 3 in the Word Sort where Bin 3 indicates a lexical item that may take either the Bin 1 or the Bin 2 feature. The x indicates that neither of the features considered in Bins 1 and 2 are relevant to the lexical item in question. The x coding is based on the outcome of Ss' sorting of items into Bin 4.

It will be noted that in the cases of person, man and woman a coding of O has been assigned for the ENGAGE feature. This symbol (assigned by the writer and not the subjects) indicates that with respect to the feature in question, the coding is indeterminate or unspecified. That is to say, that these lexical items do not specify a +, -, v, or x coding on the ENGAGE feature. The necessity for positing a O coding for semantic features may be appreciated when one considers a "lexical item" such as living creature. How should such an item be coded on MARRIAGE? As Married (+), Single (-), Either

Married or Single (v), or Neither Married nor Single (x)? Since a living creature may be a person or an animal, one cannot definitely say which of these codings it should be, it can be any of these. Similarly, for person, man, and woman, the feature ENGAGE may or may not be relevant depending on the coding of MARRIAGE. Since MARRIAGE is coded v for all three of the items, one cannot determine whether ENGAGE is or is not relevant. The coding of 0 indicates this case of unspecified coding. The usefulness of such codings as v, x and o is evident when dealing with such problems as entailment. For example, The person is not a man usually implies that the person is a woman, and not someone of neither sex. The v coding on SEX as specifically either + or - for person allows a definite implication with respect to SEX to be made when one of the possibilities (+ in this example) is eliminated.

Sentence Ratings. The distribution of frequencies with respect to the four sentence types of 1) Informative, 2) Redundant, 3) Contradictory, and 4) Amphigorous were tabulated for each of the 156 sentences. (The usual total of 28 responses per sentence (there were 28 Ss) sometimes dropped to 27 when an S neglected to rate an item). Each sentence was then categorized on the basis of that semantic type which received the highest frequency of responses, i.e., the mode. Sentences were then paired off, each pair of sentences comprising the same lexical items but in different orders, e.g., 21) The man is a husband. with 22) The husband is a man. The modal semantic response for each sentence pair was then noted. For example, with regard to the pair above, the mode for sentence 21 was that of Type 1 Informative (25 responses) and for Sentence 22, the mode was that of Type 2 Redundant (20 responses). On the basis of the mode for each pair of sentences, four semantic type combinations became evident. They are Informative-Redundant (Types 1-2), Informative-Informative (1-1), Contradictory-Contradictory (3-3), and Amphigorous-Amphigorous (4-4). Sentence results will be reported on the basis of these divisions.

Sentence pairs with the Informative-Redundant semantic modes are presented in Table 3. A typical pair is #1 and 2. Here sentence 1,

Table 3 goes here

The sheep is a ram, has been rated by 26 out of 28 Ss as Type 1, Informative. Sentence 2, The ram is a sheep, has been rated as Type 2, Redundant, by 24 out of 28 Ss. The median for the Type 1 Informative category is 26.0. Type 1 responses account for 92.2% of the responses of the entire distribution (464/503). For the Type 2 Redundant category, the median is 24.5. The Type 2 responses account for 87.0% of the responses (436/501).

Sentence pairs with the Informative-Informative semantic modes are presented in Table 4. For the four pairs involved (#37 to 44) the

Table 4 goes here

combined median for the Type 1 category is 17.0. The Type 1 responses account for 60.1% of the responses of the entire distribution. One sentence, 44) The betrothed is a woman, has been placed in the Informative category although its mode would place it in the Redundant category. The reason for including this item with the Informatives will be discussed later.

Sentence pairs with the Contradictory-Contradictory semantic modes are presented in Table 5. The overall combined median of the Type 3

Table 5 goes here

category for these sentences (#45 to 78) is 20.5. The Type 3 responses account for 75.5% of the responses of the entire distribution. An inspection of the feature codings of the pairs of lexical items comprising these sentences indicates that they involve conflict (+ vs. - on the same dimension) on at least one of the features of SEX (Male vs. Female), MARRIAGE (Married vs. Single) or ENGAGE (Engaged vs. Unengaged). In order to investigate the occurrence of possible differential effects due to variable feature coding, sentence pairs have been divided into four categories, A, B, C and D. In case A the lexical items are those which conflict on a single dimension (SEX in all instances) but which have identical codings on all other dimensions,

e.g., ram and ewe, husband and wife. Case B also involves conflict on a single dimension, but the lexical items do not have identical codings on all other dimensions, e.g., woman and husband (a conflict does not occur on MARRIAGE too because woman is coded as either Married or Single). Case C involves lexical items which conflict on the three dimensions of SEX, MARRIAGE, and ENGAGE, e.g., husband and fiancee. Lastly, case D involves conflict on the two dimensions of MARRIAGE and ENGAGE, e.g., husband and fiance, spouse and betrothed.

The combined median of the Type 3 Contradictory category for A is 27.5, for B 20.5, for C 18.0 and for D 20.0. A median test was applied to test the significance of the differences between these medians of the four groups (Siegel, 1956). The difference between the median of group A (27.5) and each of the other groups B (20.5), C (18.0) and D (20.5) was significant. The probability values were as follows: A-B, $p < .001$; A-C, $p < .02$; and A-D, $p < .001$. None of the comparisons made between the differences of B-C, B-D and C-D were found to be significant.

Sentence pairs with the Amphigorous-Amphigorous semantic modes are presented in Table 6. The overall combined median of the Type 4 category

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Table 6 goes here

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for these sentences (#79 to 156) is 21.0. Thus, the Type 4 Amphigorous responses account for 79.9% of the responses of the entire distribution. All of these sentences involve conflict on either the dimension of ANIMATENESS (Animate vs. Inanimate) or the dimension of HUMANNESS (Human vs. Animal). A SEX conflict sometimes occurs with the HUMANNESS conflict, but it never occurs alone.

An inspection of the modes for the sentences which conflict on HUMANNESS (#103-156) suggested that the less definitely coded (more v's) lexical items of person, man, and woman result in a more marked amphigorous effect when combined with sheep, ram, and ewe than do the more definitely coded (more $\pm$'s and $-$'s) lexical items of spouse, betrothed, wife, husband, fiance, and fiancee. To test this hypothesis,

the HUMANNESS conflict sentences were divided into two groups, B (#103-120) and C (#121-156), the less and the more definitely coded items, respectively.

The combined median of the Type 4 Amphigorous category for A (ANIMATENESS conflict) is 28.0, for B (HUMANNESS conflict, less definite codings) it is 22.5, and for C (HUMANNESS conflict, more definite codings) it is 19.0. The median test was applied to test the significance of the differences between the medians of the three groups. The difference between the median of group A (28.0) and each of the other groups B (22.5) and C (19.0) was significant, A-B, $p < .001$ and A-C, $p < .001$. The difference between B and C was also significant, $p < .02$.

A summary chart showing the medians obtained for the various semantic sentence-pair types is presented in Table 7. Also indicated,

Table 7 goes here

in parentheses, is the percentage of responses which is accounted for by the type in question.

Type Descriptions. It will be recalled that in the instructions it was suggested to Ss that they write down a brief description of each of the four sentence types. All of the Ss did so, and the descriptions they gave of sentence Types 1, 2, 3 and 4 are shown in Tables 8, 9, 10 and 11, respectively. For the Type 1 (synthetic) examples, most of the

Tables 8, 9, 10 and 11 go here

Ss identified a "general to specific" relationship. For the Type 2 (analytic) examples, a "specific to general" relationship was identified by most of the Ss. All Ss identified the Type 3 (contradictory) examples as "opposite" in some way. The Type 4 (amphigorous) examples were identified by most of the Ss as "nonsense", "unrelated", or "irrelevant". As evidence by these results, Ss showed a high degree of agreement in their description of the four sentence types.

DISCUSSION

Semantic Categories. The sentence results provide evidence which supports a distinction between the informative (synthetic), redundant (analytic), contradictory and amphigorous semantic categories. An inspection of the sentences placed in each of these categories by the Ss seem to be rather clear cases of the notions in question. The informative median of the Informative-Redundant pairs (Table 3) is 26.0, and for the Informative-Informative pairs (Table 4) it is 17.0. In both cases a substantial percentage of the total responses is accounted for by the informative type. With respect to the informatives of the Informative-Redundant pairs, 92.2% of the responses of that set of sentences is accounted for, with respect to the informatives of the Informative-Informative pairs it is 60.1%. The redundant median (Table 3) is 24.5 and this type accounts for 87.0% of the responses. The median for the contradictory sentences (Table 5) is 20.5 and 75.5% of the responses is accounted for. For the amphigorous sentences (Table 6) the median is 21.0, and 79.9% of the responses of that set of sentences is accounted for. The relatively high proportion of subject agreement obtained with respect to the semantic categories suggests quite strongly that the basis of such distinctions is well-founded. More research on the problem is of course necessary, for this study certainly does not meet with Quine's request for "an impressively broad range of sentences" (Quine, 1967).

It is interesting to note that while the median of the informative sentences of the Informative-Redundant pairs is 26.0, the median of the informative sentences of the Informative-Informative pairs is only 17.0. An inspection of the sentences indicates that two classes of informative sentences are involved. The first class, found in the Informative-Redundant set, e.g., The sheep is a ram, The person is a woman, The spouse is a husband, are all cases where the second lexical item can be said to be a member of the class which is denoted by the first lexical item. The second class of informative sentences, all of those of the Informative-Informative set, e.g., The woman is a spouse,

The betrothed is a man, are all cases where it cannot be definitely said that the second lexical item is a member of the class which is denoted by the first lexical item.

It seems that Ss did not utilize a general concept such as informative or contingently true or false which would cover both classes of sentences for according to the descriptions which the Ss gave for the Type 1 (informative) examples (Table 8), it would appear that most of the Ss applied a concept which was relevant only to the first class of informative sentences, but not to the second set. The notion of a class and a member of that class is the one which appears in a majority of the descriptions. Such a notion is a difficult one to apply to the Informative-Informative sentences. According to the results, Ss were split in assigning the Type 1 and Type 2 notions to these sentences. It may be that the reason the informative category received more responses than the redundant category is that there were some Ss in the group who did utilize a general Type 1 concept such as informative, or contingently true or false. Just four or five Ss holding the general Type 1 notion would be sufficient to bring about a dominant informative outcome. The case of the Informative-Informative sentence, The betrothed is a woman which was rated by 11 Ss as informative, but by 16 Ss as redundant may reflect the frequent interpretation by some that betrothed is coded Female, even though the glossing of that item as either Male or Female appeared in the Instructions provided Ss.

With respect to the subdivision of contradictory sentences (Table 5) into four categories, A where the pairs of lexical items conflict on a single dimension (SEX in all instances) but which have identical codings on all other dimensions, e.g., husband and wife, B where the pairs of lexical items conflict on a single dimension, but the lexical items do not have identical codings on all other dimensions, e.g., woman and husband, C where lexical items conflict on the two dimensions of SEX and MARRIAGE, e.g., husband and fiancee, and D where items conflict on the dimension of MARRIAGE, e.g., husband and fiance. That the median for A (27.5) was significantly higher than that for B (20.5),

C (18.0) and D (20.0) indicates perhaps contrary to the expectation of many, that the degree of contradiction does not increase with a greater number of conflicts. The most highly contradictory case of all is that of A. A glance at the items involved in this set is sufficient for one to identify each pair by their common name, antonyms. One may propose then that the defining characteristics of antonyms be said to be 1) conflict on a single dimension, 2) identical codings on other dimensions.

The amphigorous sentences (Table 6) were divided into three categories, A ANIMATENESS conflict, B HUMANNESS conflict with less definitely coded lexical items and, C HUMANNESS conflict with more definitely coded lexical items. The median for the ANIMATENESS conflict group (28.0) was significantly higher than the medians for either of the HUMANNESS conflict groups (B is 22.5, and C is 19.0). The reason for such a difference seems to be related to the notion of a semantic feature hierarchy. A discussion of these relations with respect to such a notion will be presented in one of the sections to follow.

The median of the B group of sentences (HUMANNESS conflict, has definite codings) was found to be significantly higher than the C group of sentences (HUMANNESS conflict, more definite codings). Why this should be the case is not clear to this writer. (I would have predicted just the reverse situation. To me, the C sentences seem even more nonsensical than the B ones because they are definitely coded (+ and -) on the MARRIAGE and ENGAGE features.)

Varying the relations between lexical items (by reversing the order of nouns) had different effects depending on the semantic category in question. Sentences which were classified as contradictory, or amphigorous with one ordering of nouns were rated the same when the order of nouns was reversed, i.e., there was no order effect for these categories. On the other hand, sentences classified as informative with one ordering of nouns were classified as either informative or redundant when the order was reversed. Data bearing on the case where a redundant sentence remains a redundant sentence whatever the noun order was not collected since such a case is where both nouns are

identical, e.g., The man is a man, and that given examples Ss would undoubtedly rate such sentences as redundant. Incorporating such hypothetical findings (Redundant Redundant) with the actual findings, the relationships among semantic categories when noun ordering is reversed may be summarized as follows: Informative → Informative, or Redundant; Redundant → Redundant, or Informative; Contradictory Contradictory; and Amphigorous → Amphigorous.

With the semantic categories and the relationships between categories thus empirically established, the discussion that follows will attempt to provide an explanation which accounts for these distinctive outcomes. Since a semantic feature hierarchy is considered to play a vital explanatory role concerning the semantic facts under consideration, evidence pertaining to such a structure will first be discussed.

Evidence of Semantic Features. The Word Sort provides data which supports the contention that the dimensions of ANIMATENESS, HUMANNESS, SEX, MARRIAGE and ENGAGE are ones which underlie the lexical items in question. The results show that a relatively high proportion of Ss, a majority in all cases, labelled and sorted the lexical items in accord with these dimensions. Whether or not these semantic features are truly basic semantic elements cannot be determined at present. Katz postulates conceptual elements (semantic markers), Osgood (1968) postulates semantic features, Bierwish (1968) postulates elementary predicates. However, as Langendoen (1969) points out, how do we know if the particular ones we have chosen are indeed the elementary ones? A theory of universal semantics which specifies the nature of these elements is necessary as a first step. Since none is available, the semantic features which were posited in this study solely on the basis of English language data can only be regarded as candidates for elementhood. I would agree with Wilson (1967) that until more comparative evidence has been collected "talk about linguistic universals is somewhat fraudulent."

Leaving the problem of elemental semantic features aside, the Word

Sort results indicate that speakers of English do have such concepts as ANIMATENESS, HUMANNESS, SEX, MARRIAGE, and ENGAGE. Further evidence indicates that speakers have these concepts arranged hierarchically.

Evidence of a Semantic Feature Hierarchy. While direct evidence pertaining to a postulated hierarchy of features is not available, compelling indirect evidence is, and it is derived primarily from the Informative-Redundant sentence pairs (Table 3). In this regard Table 12 has been drawn up. This table shows the lexical items arranged

Table 12 goes here

in various sets which represent all of the Informative-Redundant pairs of sentences. Each arrow joins two lexical items. The two lexical items joined by the arrow are those items which are involved in the sentence frame, The _____is a _____. A sentence results if one reads from top to bottom, another from bottom to top. Thus the arrow joining man and husband produces the sentence, The man is a husband when read from top to bottom, but produces The husband is a man when read from bottom to top. The reading from top to bottom results in sentences rated as Informative while the reading from bottom to top results in sentences rated as Redundant.

It will be noted that four new "lexical" items, living thing, single person, male single person and female single person, have been added to the lexical sets. These are not actual lexical items in English, but potential ones. They have been introduced in order to assist in developing the argument for feature ordering. The feature codings which I have assigned these items are specified in the lower half of Table 2. The four potential items have been situated in the various lexical sets of Table 12 so that Informative-Redundant relations among the items obtain. In this writer's view, the relations which have been assigned are those which one might reasonably expect to find from an empirical test. The following sentences are regarded as redundant: The person (or man, woman, spouse, husband, wife) is a living thing. (Set 1); The single person (or male single person,

female single person, betrothed, fiance, fiancee) is a living thing (Set 2); and, The sheep (or ram, ewe) is a living thing (Set 3). The informative sentences are those for which the order of the lexical items of the redundant sentences is reversed, e.g., The living thing is a person (or man, woman, spouse, husband, wife).

The lexical items in each of the three sets in Table 12 form what may be termed class inclusion hierarchies in that lexical items on lower levels are class members of those lexical items which are found on higher levels, providing that the items in question are joined by arrows. Thus, in Set 1, husband is a member of the classes of spouse, man, person and living creature. And in Set 2, for example, betrothed is a member of the classes of single person, person, and living thing.

An inspection of these data and of the feature codings of the lexical items involved, indicates that semantic features (the + and - codings) are ordered in terms of the sequence in which they make their first appearance. Each lower division of lexical items displays a feature coding of + or - which the division just above it does not have, but which the division below it does have. The semantic features in order of appearance are 1) ANIMATENESS (A), 2) HUMANNESS (H), 3) SEX (S), 4) MARRIAGE (M), and 5) ENGAGE (E). Thus, in the uppermost division, living thing is definitely coded (+ or -) for A; below that one, person and sheep are definitely coded for A and H; below that one, man, woman, ram, and ewe are definitely coded for A, H, and S; below that one, husband, wife, spouse, male single person, female single person, and single person are definitely coded for A, H, S and M; and below that one, fiance, fiancee, and betrothed are definitely coded for A, H, S, M and E. These data lend much credence to the notion of a hierarchy of semantic features.

Such a finding is directly contrary to the expectations of some theorists, Weinreich (1966) for example. Weinreich concluded that ..."no theoretical motivation is in prospect for specifying the order of features in a path" and that while "The prospect that implicational relations among markers, such as those discussed by Katz and Postal,

and Chomsky may automatically yield unique networks of features, is attractive, ...it is unlikely to be borne out when non-anectdotal evidence is considered." (p. 409) The necessity for postulating lexical and featural hierarchical structures to account for certain semantic facts has been felt by many theorists besides those mentioned by Weinreich. Lyons (1968) and Bever and Rosenbaum (1968) posit such hierarchies for explanatory purposes as do many anthropologists engaged in semantic analysis, such as Metzger and Williams (1966)[2], for example.

Given the feature codings of each lexical item (Table 2) and a specification of the hierarchical relations among the semantic features (Table 12), a set of rules may be devised which would generate such lexical items, each with semantically appropriate feature codings. Such a set of rules may be regarded as a formal representation of the semantic knowledge which each subject holds. These rules are given in Table 13. Each rule specifies a combinatorial relationship between

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Table 13 goes here

---

features. Thus rule 1 combines OBJECT and ANIMATENESS, rule 2 combines ANIMATENESS and HUMANNESS, rule 3 combines HUMANNESS and SEX, rule 4 combines SEX and MARRIAGE and rule 5 combines MARRIAGE and ENGAGE. Some of the rules are context sensitive, i.e., they can only be applied in a certain context. The pertinent context is indicated following a slash (/). Thus, rule 4 specifies that any of S+, S-, and Sv (braces denote optional selections) will (a) combine with M+ or M- or Mv only in the context H+, i.e., if H+ has already been assigned to the incipient lexical item, and (b) combine with Mo only in the context Hv.

To generate a lexical item it is necessary that one option from each of the five rules be selected. It is obligatory that the rules be selected in order otherwise semantically inappropriate items will be generated. It will be noted that no rule involves the coding of x. This coding is assigned when none of the options of a rule can be applied. For example, suppose we first select rule 1, O ⟶ A-. Now that we have A-, and go on to rule 2, we see that A- cannot enter into

any option, and so we assign the coding x to H, i.e., Hx. We then see that Hx cannot enter into rule 3, so again we must assign x, this time to S for Sx. Since rules 4 and 5 likewise cannot be applied we are provided with the codings Mx and Ex. The resulting coding strip, A-Hx Sx Mx Ex is that of the lexical item chair. As another example, suppose rule 4, S+ $\longrightarrow$M+ is selected. We note that M+ does not appear in rule 5. Since the rule cannot be applied we are left with Ex. The advantage of such a rule which assigns x when none of the other rules apply is that x codings may be generated for features which are irrelevant to a particular lexical item. Such a rule simply reflects the common sense notion that it is not necessary for us to know all of the features which are irrelevant to a lexical item; it is enough for us to know what features are relevant to the item, i.e., the +, -, or v codings.

Application of the five rules with all of the options, given O (OBJECT) will generate all of the lexical items which have been used in this study and other appropriate ones as well. In all, these rules will generate semantic features for 22 lexical items. These items may be said to constitute a semantic field since many of them are highly interrelated. Figure 1 shows the feature codings of the lexical

Figure 1 goes here

items of the field. The lexical items are shown along the bottom of the figure. Potential lexical items are shown in parentheses. By tracing a path upward from a lexical item to the top of the figure, one can determine the feature codings for that lexical item. For example, husband, which is located at the extreme left of the page, is coded (reading upward) Ex, M+, S+, H+ and A+. The rules from Table 13 which provide these codings for husband are, O $\longrightarrow$A+, A+ $\longrightarrow$H+, H+ $\longrightarrow$S+, S+ $\longrightarrow$M+/H+. Since M+ cannot enter into any of the options of rule 5, it is assigned x on E. While many more potential items could have been generated by the inclusion of such rules as Av $\longrightarrow$ Hv and Ao $\longrightarrow$Ho, this was not done since it was felt that a consideration of the validity of such rules was beyond the scope of the present study.

Each rule, it will be recalled, indicates which semantic features are to combine with one another in a lexical item. A rule such as Animate (A+) ⟶ Human (H+) or Animal (H-), for example, indicates that H+ and H- combines with A+. Since the semantic features is conceived of as a basic element (like the distinctive features of generative phonology) then the result of the H+ and A+ combination, let us say H+ A+, is something other than either the feature H+ or the feature A+. The result, H+ A+, obviously cannot be regarded as an element since it is itself composed of the elements H+ and A+. At this juncture, I should like to repeat the warning which Katz (1966) gave his readers when he was explicating the notion of semantic marker. He said, "It is important to stress that, although the semantic markers are given in the orthography of a natural language, they cannot be identified with the words or expressions of the language used to provide them with suggestive labels. Rather, they are to be regarded as constructs of a linguistic theory, just as terms such as 'force' are regarded as labels for constructs in natural science." (1966). I mention this so as to emphasize the point that the lexical items <u>human</u> and <u>animate</u>, for example, are <u>not</u> the semantic features Human and Animate. Thus while each semantic feature is unitary, i.e., composed of a single semantic feature, the lexical item is typically composed of a number of semantic features.

In passing, I should like to remark that I think that Katz fails to heed his own good advice when later in the book he takes the view that a relation between semantic markers is one of <u>inclusion</u>. Katz presents the rule, ⟨ (Mi) v (M2) v...v (Mn) ⟩ ⟶ (Mk), where M is a semantic marker, and where (Mk) is distinct from each (Mi), and where v is the symbol for disjunction. As an example of this rule he offers, ⟨ (Mi) v (M2) v...v (Human) v (Animal) v (Artifact) v (Plant) v...v (Mn) ⟩ ⟶ (Physical Object). (p. 231) Katz states that, "...such rules can be interpreted as saying that the concepts represented by the semantic markers on the left-hand side are included under the concept represented by the semantic marker on the right hand side." (p. 233) Thus, the

semantic markers, Human, Animal, Artifact, etc. are included in the semantic marker Physical Object. However, to regard Physical Object as a semantic marker, i.e., element, is incompatible with my notion of element which I believe is much the same as Katz's since he says, "Semantic markers represent the conceptual elements into which a reading decomposes a sense. They thus provide the theoretical constructs needed to reconstruct the interrelations holding between such conceptual elements in the structure of a sense." (1966, 155-6) To follow through on Katz's notion of feature inclusion would lead one to an outcome where even the reading given a lexical item must be considered an elemental semantic marker since the reading itself includes all of the other semantic markers. If such were the case, the sense of a lexical item would not be decomposable into semantic elements and there would be no need to posit such an entity as the semantic marker.

In light of the preceding discussion the question may be raised as to whether the term semantic feature may be legitimately applied, for example, to all of the following notions, S+ (Male), S- (Female), Sv (Either Male or Female), Sx (Neither Male nor Female) and So (one of S+, S-, Sv, Sx). Although each has been loosely referred to as such throughout this paper, properly speaking, we may say that only two, S+ and S- are semantic features since the others are derivable from them. The alternation of S+ and S- is Sv, the negation of S+ and S- is Sx, and the alternation of S+, S-, Sv, and Sx is So. It should be kept in mind that while in this case there are only two features in conflict (S+ and S-) there may be more than two such features in conflict as for example, the case of Yellow, Red, and Blue. It is not always possible to derive all features from one simply by introducing an opposition operator. For example, while the opposite of Male may be said to be Female (or vice versa), the opposite of Yellow, can't be said to be definitely Red or definitely Blue. We can only say it must be one of the set. In this system, only the symbols with + and - codings are considered as elemental semantic features since the v and x codings are derived from them, and the o coding is derived from all of them.

Semantic Categories and Semantic Interaction. Given the constant syntactic environment, it may be said that the semantic outcomes of Informative, Redundant, Contradictory and Amphigory are a function of the interaction between the two experimental lexical items which constitute each sentence. The following discussion will attempt to make explicit the nature of the interaction which takes place. In this regard the codings of the lexical items in terms of their semantic features (Table 2) will be utilized, along with a set of operating rules which this investigator has devised.

A survey of the feature codings of all pairs of lexical items for the Redundant sentences shows that for the various features only a certain combination of codings occurs. These combinations are shown in Table 14. They are listed with the combination identification (Combo ID)

Table 14 goes here

numbers 1 to 11. The feature coding for the first lexical item in a sentence is shown in the column designated L1, while the feature coding for the second lexical item (always on that same feature) is shown in column L2. Since Ss rated the sentences with such feature coding combinations as Redundant, it is reasonable to assume that the second lexical item provided no new information which the first lexical item did not already bear. Thus, in terms of new information (the NEW INFO column) none has been offered, and this in indicated by Θ. It may be said that these combinations provide No News (in the COMBINATION TYPE column). An example of a Redundant sentence, its codings, and the determination of the semantic type outcome is shown in Table 15.

Table 15 goes here

Examples of Informative, Contradictory, and Amphigorous sentences are also shown.

For the Informative sentences, a survey of the feature codings of all pairs of lexical items shows that while some No News combinations may or may not occur, certain other combinations always occur. At least one of these certain other combinations occurs in the pair of

lexical items for each Informative sentence. These combinations are listed in Table 10 with IDs from 12 to 17. The new information which each of these combinations provides is indicated in the NEW INFO CODING column. The name for this combination type has been termed News. The determination of information codings and the other combination types was made by this investigator on an intuitive basis.

While most of the Contradictory and the Amphigorous sentences have some News and No News combination types, all have at least one + - or one - + coding combination. These combinations, which are called Conflict, are listed as IDs 18 and 19. Other combinations also occur in the Contradictory and Amphigorous sentences. These combinations all involve an x coding. They are termed Irrelevant and have IDs from 20 to 25.

The coding conditions which result in the various combination types may be summarized with the following set of rules:

1) No News if (a) L1=L2, or (b) L2=0.

2) News if (a) L1=0 and L2= other than 0, or (b) L1=v and L2=+ or -.

3) Conflict if (a) L1=+ and L2=-, or (b) L1=- and L2=+.

4) Irrelevant if (a) L1=x and L2=+, - or v, or (b) L1=+, - or v, and L2=x.

All outcomes but one seem to be intuitively obvious. The exception is rule 2b where, if L1=v and L2=+ or -, then the outcome is News. It is possible that the Ss could have arrived at a Conflict or a No News outcome when considering such a combination as L1=v and L2=+. After all, since v is composed of + and -, the + of L2 could have been compared with the - of L1 to yield Conflict (- vs. +), or the + could have been compared with the + of L1 to yield No News (+ vs. +). Neither situation obtained, however. Ss preferred to interpret the situation as one where information (News) was provided; where the + coding on L2 was used to reduce the uncertainty of the v coding on L1. That this and not the other situations obtained seems in accord with one of the basic assumptions which J. L. Austin (1955) made about language. He said, "It is fundamental in talking (as in other matters) that we are entitled to trust others, except in so far as there is some concrete reason to

distrust them. Believing persons, accepting testimony, is the or one main point of talking. We don't play (competitive) games except in the faith that our opponent is trying to win: if he isn't, it isn't a game, but something different. So we don't talk with people (descriptively) except in the faith that they are trying to convey information."

The Contradictory sentences may be distinguished from the Amphigorous sentences on either of two grounds, 1) the number of Irrelevant combinations for the Contradictory sentences is low (0 to 1) while the number of Irrelevant combinations for the Amphigorous sentences is high (2 or more), or 2) the Contradictory sentences involve Conflict on the particular features of SEX, MARRIAGE or ENGAGE while the Amphigorous sentences involve Conflict on the particular features of ANIMATENESS or HUMANNESS. The operation of the first of these grounds is demonstrated in Table 15. It should be noted that both criterions relate to the semantic feature hierarchy and that both possibilities are related to one another. For, the number of Irrelevant combinations increases as the locus of conflict is found higher up the feature hierarchy. Unfortunately, the present study has only one piece of evidence which bears on the problem of determining the adequacy of these formulations. The finding of a significant difference on the Amphigorous sentences between the median for sentences with an ANIMATENESS conflict (28.0) and the median for sentences with a HUMANNESS conflict (22.0 and 19.0) seems best accounted for by (1) the number of irrelevants' hypothesis. One could hold that the feeling of amphigory is stronger for sentences with the ANIMATENESS conflict than for sentences with the HUMANNESS conflict because there is one more Irrelevant combination associated with sentences with an ANIMATENESS conflict than there is for HUMANNESS conflict. The difference between the medians is not explained though by (2) the 'particular feature' hypothesis. Such an hypothesis is an all-or-none affair which doesn't permit a gradation between ANIMATENESS and HUMANNESS.

Anomaly, Amphigory and Category Mistake. The treatment of amphigory as presented in this paper is one that is distinct from that

of contradiction (as was shown) and that of anomaly. Katz and others have viewed anomaly as an outcome resulting from a violation of a selection restriction. This notion is clearly illustrated by Katz and Fodor (1963) in their consideration of the lexical item honest: "...of persons: of good moral character, virtuous, upright,...of women: chaste, 'virtuous'...The "of persons" and "of women" are intended to indicate that the senses that follow them (italics mine) apply only under the conditions that they specify. That is, these specifications indicate that if the nominal head which honest modifies refers to a person without specification of sex, then honest has the meaning "of good moral character, virtuous, or upright," and if the nominal head refers to a woman, then honest means either "of good moral character, virtuous, or upright," or "chaste.""(p. 500)

Clearly the amphigorous category which is described in this paper is determined quite differently than that of anomaly. While the information pertaining to a selectional restriction violation is not conceived to be part of the meaning of that word, the information involved in the "violation" which leads to an amphigorous categorization is actually part of its meaning. It would be difficult to hold that the semantic feature Human for the lexical item person, and the feature Animal for the lexical item sheep are not part of the meaning of those lexical items but that they were instead selectional restrictions.

The notion of amphigory seems to be related to that of category mistake (or type crossings) a notion which has been the concern of many in recent philosophy. Such sentences as Saturday is in bed (Ryle, 1953), Socrates is a prime number, The theory of relativity is blue (Pap, 1960), and Seeing is an activity (Faber, 1965), are some of the favorite examples of this notion which have been considered. Both amphigory and anomaly (Katz's) appear to be instances of that notion. Whether or not amphigory and anomaly provide criterions which fully account for the notion is hard to say. The notion of category mistake is still one that is somewhat unclear.

Summary. This study which investigated the meaning of sentences provides supporting evidence toward establishing the validity of the semantic categories of informative (synthetic), redundant (analytic), contradictory and amphigory. A criterion for each of these semantic types was proposed based on such notions as semantic features, a hierarchy of semantic features, and rules of semantic interaction.

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Footnotes

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2 Anthropologists Metzger and Williams (1966) present lexical hierarchies based on data collected from Mayan informants in Mexico. One interchange between an interviewer and an informant which provided data on which a hierarchy was later based, ran as follows (translated from Mayan):

> "How are they named, the things of mother earth in all the world?
> ---There are many of the kind.
> What is the name of a first kind?
> ---There are people.
> What is the name of a second kind?
> ---There are animals.
> What is the name of (another of) a third kind?
> ---There are 'trees-and-plants' (a single lexical item).
> What is the name of (another of) a fourth kind?
> ---There are no more (of a fourth different kind)." (p. 391)

Since the interviewer was interested in eliciting "firewood" data, his questioning then focused on the 'trees-and-plants' category --Studies of this sort could provide valuable data for the study of semantic universals.

TABLE 1

Word Sort Responses With Respect to Five Postulated Semantic Dimensions

S	ANIMATENESS Animate - Inanimate	HUMANNESS Human - Animal	SEX Male - Female
1	_____	human - unhuman	male - female
2	inanimate objects - humans - animals	non animals - animals	male - female
3	living - inanimate	human - animal	male - female
4	fleshlike - wooden	human - animal	male - female
5	_____	_____	male - female
6	animal - inanimate - furniture	_____	male - female
7	mammal - object	human - animals	male - female
8	animate - inanimate	human - inhuman (sic)	male - female
9	human - animal - inanimate	human - animal - not living	male - female
10	animate - inanimate	human - animal - plant	male - female
11	_____	human - animal	male - female
12	_____	human - animal	male - female
13	_____	human - animal	male - female
14	living - inanimate	human - non human	male - female
15	inanimate - human - not human		_____
Total	10	13	14

TABLE 1 (Continued)

S	MARRIAGE Married - Single	ENGAGEMENT Engaged - Unengaged	NO. SORTS DONE BY Ss
1	married - unmarried	_____	9
2	married - single	engaged - married	13
3	married - single	_____	11
4	wed - marriageable	settled - dating	8
5	married male - married female	male engaged - female engaged	11
6	married - single	_____	8
7	married - single	engaged - married	7
8	married - single	engaged - married - single	7
9	married - single	engaged	8
10	married - single	_____	11
11	married - not married	_____	8
12	_____	_____	8
13	married - not married	is about to be married - already married	8
14	married - engaged - single unattached		8
15	married - unmarried	_____	7
Total	14	8	59/132

TABLE 2

Feature Codings for the 13 Experimental Lexical Items Based on the Word Sort Results

+, or - indicates a specific coding on feature.

v indicates either + or - coding on feature.*

x indicates neither + nor - coding on feature.

LEXICAL ITEM	ANIMATENESS + Animate - Inanimate	HUMANNESS + Human - Animal	SEX + Male - Female	MARRIAGE + Married - Single	ENGAGE + Engaged - Unengaged
chair	-	x	x	x	x
sheep	+	-	v	x	x
ram	+	-	+	x	x
ewe	+	-	-	x	x
person	+	+	v	v	o
man	+	+	+	v	o
woman	+	+	-	v	o
spouse	+	+	v	+	x
husband	+	+	+	+	x
wife	+	+	-	+	x
betrothed	+	+	v	-	+
fiance	+	+	+	-	+
fiancee	+	+	-	-	+
living creature	+	v	v	o	o
single person	+	+	v	-	v
single male person	+	+	+	-	v
single female person	+	+	-	-	v

* The symbol v is to be interpreted in the exclusive (aut) sense rather than in its usual logical non-exclusive (vel) sense.

TABLE 3

Informative-Redundant Sentences

Semantic Types: 1) Informative, 2) Redundant, 3) Contradictory, 4) Amphigorous

			INFORMATIVE					REDUNDANT				
SENTENCE			SEMANTIC TYPE					NOUN ORDER REVERSED SEMANTIC TYPE				
ID	The _____	is a _____.	1	2	3	4	ID	1	2	3	4
1	sheep	ram	26	1	1	0	2	3	24	1	0
3	sheep	ewe	26	2	0	0	4	1	27	0	0
5	person	man	25	2	0	0	6	3	25	0	0
7	person	woman	28	0	0	0		2	26	0	0
9	person	spouse	25	3	0	0	10	3	25	0	0
11	person	husband	28	0	0	0	12	1	27	0	0
13	person	wife	27	0	0	1		2	26	0	0
15	person	betrothed	25	3	0	0	16	4	24	0	0
17	person	fiance	26	2	0	0	18	4	24	0	0
19	person	fiancee	28	0	0	0		2	26	0	0
21	man	husband	25	3	0	0	22	5	20	2	0
23	man	fiance	24	4	0	0		4	23	0	0
25	woman	wife	27	1	0	0	26	2	26	0	0
27	woman	fiancee	24	4	0	0	28	3	25	0	0
29	spouse	husband	27	1	0	0	30	5	21	1	0
31	spouse	wife	24	3	0	1	32	7	21	0	0
33	betrothed	fiance	26	1	1	0	34	4	24	0	0
35	betrothed	fiancee	23	4	1	0	36	3	22	3	0
	Total		464	34	3	2		58	436	7	0
	Median		26.0	2.0	0	0		3.0	24.5	0	0

TABLE 4

Informative-Informative Sentences

SENTENCE			INFORMATIVE SEMANTIC TYPE				INFORMATIVE NOUN ORDER REVERSED SEMANTIC TYPE				
ID	The _____ is a _____.		1	2	3	4	ID	1	2	3	4
37	man	spouse	18	9	0	1	38	17	11	0	0
39	man	betrothed	19	8	0	1	40	16	12	0	0
41	woman	spouse	16	12	0	0	42	17	10	1	0
43	woman	betrothed	20	7	0	0	44	11	16	0	1
	Total		73	36	0	2		61	49	1	1
	Median		18.5	8.5	0	0.5		16.5	11.5	0	0
	Combined Total		134	85	1	3					
	Combined Median		17.0	10.5	0	0					

TABLE 5

Contradictory-Contradictory Sentences

A. Conflict on SEX only, other feature codings are identical.

SENTENCE			SEMANTIC TYPE				NOUN ORDER REVERSED				
							SEMANTIC TYPE				
ID	The _____ is a _____.		1	2	3	4	ID	1	2	3	4
45	man	woman	0	0	28	0	46	0	0	28	0
47	fiance	fiancee	1	0	26	1	48	0	0	27	0
49	husband	wife	0	0	28	0	50	0	0	28	0
51	ram	ewe	1	0	27	0	52	0	1	27	0
	Total		2	0	109	1		0	1	110	0
	Median		0.5	0	27.5	0		0	0	27.5	0
	Combined Total		2	1	219	1					
	Combined Median		0	0	27.5	0					

B. Conflict on SEX only, other feature codings not identical.

53	man	wife	0	0	26	2	54	0	0	21	7
55	man	fiancee	9	1	13	5	56	1	8	14	5
57	woman	husband	0	0	23	5	58	0	0	23	5
59	woman	fiance	9	0	15	4	60	0	5	20	3
	Total		18	1	77	16		1	13	78	20
	Median		4.5	0	19.0	4.5		0	2.5	20.5	5.0
	Combined Total		19	14	155	36					
	Combined Median		0	0	20.5	5.0					

TABLE 5 (Continued)

C. Conflict on SEX, MARRIAGE

SENTENCE			SEMANTIC TYPE				NOUN ORDER REVERSED				
								SEMANTIC TYPE			
ID	The _____ is a _____.		1	2	3	4	ID	1	2	3	4
61	husband	fiancee	0	1	17	9	62	0	0	18	10
63	wife	fiance	0	1	20	7	64	2	0	18	7
	Total		0	2	37	16		2	0	36	17
	Median		0	1.0	18.5	8.0		1.0	0	18.0	8.5
	Combined Total		2	2	73	33					
	Combined Median		0	0.5	18.0	8.0					

D. Conflict on MARRIAGE

65	spouse	betrothed	3	1	20	4	66	1	0	23	4
67	spouse	fiance	4	0	20	4	68	1	0	22	4
69	spouse	fiancee	2	2	20	4	70	0	2	22	4
71	betrothed	husband	8	1	12	6	72	2	3	18	5
73	betrothed	wife	6	1	16	5	74	2	4	14	8
75	husband	fiance	4	1	20	3	76	3	0	20	5
77	wife	fiancee	4	0	21	3	78	3	1	20	4
	Total		31	6	129	29		12	10	139	34
	Median		4.0	1.0	20.0	4.0		2.0	1.0	20.0	4.0
	Combined Total		43	16	268	63					
	Combined Median		3.0	1.0	20.0	4.0					
	Overall Combined Total		66	33	715	133					
	Overall Combined Median		1.0	0	20.5	4.0					

TABLE 6

Amphigorous-Amphigorous Sentences

A. Conflict on ANIMATENESS

SENTENCE			SEMANTIC TYPE				NOUN ORDER REVERSED				
							SEMANTIC TYPE				
ID	The _____ is a _____.		1	2	3	4	ID	1	2	3	4
79	chair	sheep	0	0	0	28	80	0	0	0	28
81	chair	person	0	1	1	26	82	0	0	0	28
83	chair	ram	0	0	1	26	84	0	0	0	28
85	chair	ewe	0	0	0	28	86	0	0	0	28
87	chair	man	0	0	0	28	88	0	0	0	28
89	chair	woman	0	0	1	27	90	0	0	0	28
91	chair	spouse	0	0	0	28	92	0	0	0	28
93	chair	betrothed	0	0	0	28	94	0	0	0	28
95	chair	husband	0	0	0	28	96	0	0	0	28
97	chair	wife	0	0	0	28	98	0	0	0	28
99	chair	fiance	0	0	0	28	100	0	0	0	28
101	chair	fiancee	0	0	0	28	102	0	0	0	28
	Total		0	1	3	331		0	0	0	336
	Median		0	0	0	28.0		0	0	0	28.0
	Combined Total		0	1	3	667					
	Combined Median		0	0	0	28.0					

TABLE 6 (Continued)

B. Conflict on HUMANNESS with few definite codings.

SENTENCE			SEMANTIC TYPE				NOUN ORDER REVERSED				
								SEMANTIC TYPE			
ID	The _____ is a _____.		1	2	3	4	ID	1	2	3	4
103	person	sheep	0	0	0	28	104	0	0	5	23
105	person	ram	3	0	2	23	106	0	2	2	24
107	person	ewe	1	0	1	26	108	0	2	1	25
109	man	sheep	4	2	0	22	110	1	0	0	27
111	man	ram	4	1	2	21	112	1	5	1	21
113	woman	ewe	4	1	1	22	114	1	7	1	19
115	woman	sheep	4	1	1	22	116	5	2	0	21
117	woman	ram	2	0	8	18	118	0	2	3	23
119	man	ewe	1	0	3	24	120	0	0	8	20
	Total		23	5	18	206		8	20	21	203
	Median		3.0	0	1.0	22.0		0	2.0	1.0	23.0
	Combined Total		31	25	39	409					
	Combined Median		1.0	1.0	1.0	22.5					

TABLE 6 (Continued)

C. Conflict on HUMANNESS with many definite codings.

SENTENCE			SEMANTIC TYPE				NOUN ORDER REVERSED				
								SEMANTIC TYPE			
ID	The _____ is a _____.		1	2	3	4	ID	1	2	3	4
121	spouse	sheep	4	5	0	19	122	4	5	0	19
123	spouse	ram	5	4	0	18	124	5	4	0	19
125	spouse	ewe	8	1	0	19	126	4	6	1	17
127	betrothed	sheep	7	2	0	19	128	5	1	0	22
129	betrothed	ram	6	3	0	19	130	5	4	0	19
131	betrothed	ewe	7	2	0	19	132	4	6	0	18
133	wife	sheep	3	6	0	19	134	7	1	0	20
135	wife	ram	2	1	7	18	136	0	1	8	19
137	wife	ewe	6	7	0	15	138	7	5	0	16
139	husband	sheep	3	5	1	19	140	7	2	1	18
141	husband	ram	10	1	0	17	142	4	6	0	18
143	husband	ewe	0	1	8	19	144	2	0	6	19
145	fiance	sheep	3	6	0	19	146	8	2	0	18
147	fiance	ram	6	5	0	17	148	6	3	0	19
149	fiance	ewe	2	1	6	19	150	0	3	7	18
151	fiancee	sheep	4	6	0	18	152	7	0	0	21
153	fiancee	ram	2	1	6	19	154	2	1	5	20
155	fiancee	ewe	3	8	1	15	156	6	4	0	18
	Total		81	65	29	327		83	54	28	338
	Median		4.5	3.5	0	19.0		5.0	3.0	0	19.0
	Combined Total		164	119	57	665					
	Combined Median		4.5	3.0	0	19.0					
	Overall Combined Total		195	145	99	1741					
	Overall Combined Median		2.0	1.0	0	21.0					

TABLE 7

Summary Table of Medians for the Various Semantic Types.

Figure in parentheses indicates percentage of responses accounted for by that type.

	SEMANTIC TYPE COMBINATIONS	SEMANTIC TYPE			
		Inform 1	Redun 2	Contra 3	Amphig 4
I	Informative-Redundant	26.0 (92.2%)	24.5 (87.0%)		
II	Informative-Informative	17.0 (60.1%)			
III	Contradictory-Contradictory	Overall		20.5 (75.5%)	
	A SEX conflict, identical			27.5	
	B SEX conflict, non-identical			20.5	
	C SEX, MARRIAGE, ENGAGE conflict			18.0	
	D MARRIAGE, ENGAGE conflict			20.0	
IV	Amphigorous-Amphigorous	Overall			(79.9%)21.0
	A ANIMATENESS conflict				28.0
	B HUMANNESS, less definite				22.5
	C HUMANNESS, more definite				19.0

TABLE 8

Ss' Description of the Type 1 Examples

S	Description
1	about J. S.*
2	general to specific
3	general to specific
4	general to particular (inverted defn.)
5	goes from general to more specifics
6	
7	from general to specific
8	the kind of specific a category is in living mammals
9	these sentences put categories into objects
10	general-specific
11	general → specific 2nd noun can be 1st noun
12	specific classification
13	group-ele (living or concepts)
14	could be true-not necessarily gen'l-specific
15	actual comparison with moving living subject-object
16	general to specific, classification or rate
17	second word is adjective of first word or defines closer the 1st word
18	general to specific
19	general → particular
20	general → specific
21	general to specific
22	B is A
23	object of sentence is a part of category of subject. Second part describes first part of sentence
24	general to specific
25	true; major classification first, minor classification second
26	general - specific
27	general specific
28	tells something about subject pred nom is one of group of sub

*unreadable

TABLE 9

Ss' description of the Type 2 Examples

S	Description
1	class spec-gen
2	specific to general
3	specific to general
4	particular to general (defn.)
5	sane specifies to generalizations
6	classified
7	from specific to general
8	what category a specific is in
9	these sentences put objects into a category
10	specific-general
11	specific ⟶ general 1st noun is a kind of another noun
12	general classification
13	element-group non living
14	always true specific-gen'l
15	comparison with non-moving subject-object
16	specific to general
17	first word is variety of second word
18	specific to general
19	particular ⟶ class
20	specific ⟶ general
21	specific to general
22	A is B
23	the subject is a category or part of specific group of object of sentence
24	specific to general
25	true; species first, major classification second
26	specific-general
27	specific to general
28	subject is one of a class

TABLE 10

Ss' Description of the Type 3 Examples

S	Description
1	oppo
2	extremes-opposites
3	opposites, but related
4	opposite but related in meaning (false statements)
5	opposites
6	opp
7	opposites
8	the item is opposite of another item
9	these sentences give exact opposites-contradictions
10	opposite
11	opposites
12	opposites
13	opposites
14	false-opposites
15	antonym equation
16	paradox, contradiction
17	opposites
18	opposites
19	opposites of same class
20	opposite
21	general but opposites
22	opposites
23	opposites or near opposites
24	opposite
25	opposites, untrue
26	opposites
27	opposites
28	opposites

TABLE 11

Ss' Description of the Type 4 Examples

S	Description
1	resem-nothing
2	nonsense
3	false-unrelated
4	unrelated in meaning (also false statements)
5	entirely unrelated
6	no similarity
7	nonsense not equal
8	the opposite is a nonsense correlation
9	these sentences give false meanings for the words
10	irrelevant
11	unrelated nouns can't be possible
12	nonsense
13	nonsense
14	false-not necessarily opposites
15	nonsense statements
16	nonsense
17	unrelated
18	unrelated
19	classes not related
20	no literal connection
21	no relationship
22	no connection
23	nonsense sentences
24	nonsense
25	untrue, no relation
26	nonrelated
27	irrelevant
28	nonsense, no connection between subject and pred. nom.

TABLE 12

Hierarchical Relations Among Lexical Items and Order of Appearance of Semantic Features

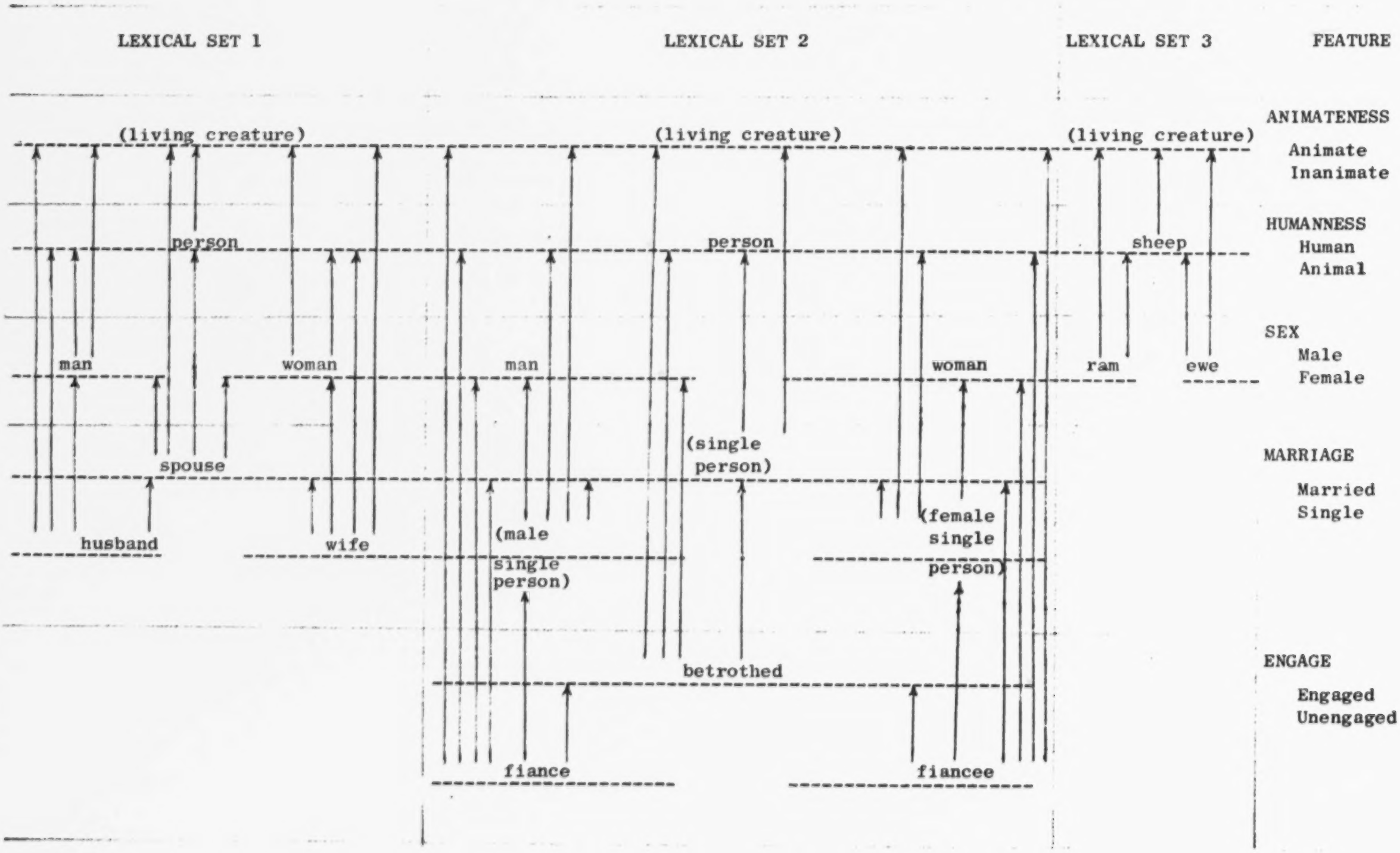


TABLE 13

Rules Which Generate the Lexical Items of a Semantic Field and their Feature Codings

O is OBJECT, A is ANIMATENESS, H is HUMANNESS, S is SEX, M is MARRIAGE and E is ENGAGE

1. $O \longrightarrow \begin{Bmatrix} A+ \\ A- \end{Bmatrix}$

2. $A+ \longrightarrow \begin{Bmatrix} H+ \\ H- \\ Hv \end{Bmatrix}$

3. $\begin{Bmatrix} H+ \\ H- \\ Hv \end{Bmatrix} \longrightarrow \begin{Bmatrix} S+ \\ S- \\ Sv \end{Bmatrix}$

4. $\begin{Bmatrix} S+ \\ S- \\ Sv \end{Bmatrix} \longrightarrow \begin{Bmatrix} M+ / H+ \\ M- / H+ \\ Mv / H+ \\ Mo / Hv \end{Bmatrix}$

5. $M- \longrightarrow \begin{Bmatrix} E+ \\ E- \\ Ev \end{Bmatrix}$

$\begin{Bmatrix} Mv \\ Mo \end{Bmatrix} \longrightarrow Eo$

TABLE 14

Rules for Semantic Coding Interaction

COMBO ID	CODING LEXICAL ITEM 1 (L1)	CODING LEXICAL ITEM 2 (L2)	NEW INFO (L1-L2)	COMBINATION TYPE (L1,L2 compared)
1	+	+	Θ	No News
2	-	-	Θ	No News
3	v	v	Θ	No News
4	x	x	Θ	No News
5	0	0	Θ	No News
6	+	v	Θ	No News
7	-	v	Θ	No News
8	+	0	Θ	No News
9	-	0	Θ	No News
10	v	0	Θ	No News
11	x	0	Θ	No News
12	v	+	+	News
13	0	+	+	News
14	v	-	-	News
15	0	-	-	News
16	0	v	v	News
17	0	x	x	News
18	-	+	+	Conflict
19	+	-	-	Conflict
20	x	+	+	Irrelevant
21	x	-	-	Irrelevant
22	x	v	v	Irrelevant
23	+	x	x	Irrelevant
24	-	x	x	Irrelevant
25	v	x	x	Irrelevant

TABLE 15

Examples Showing Operation of Rules of Semantic Interaction

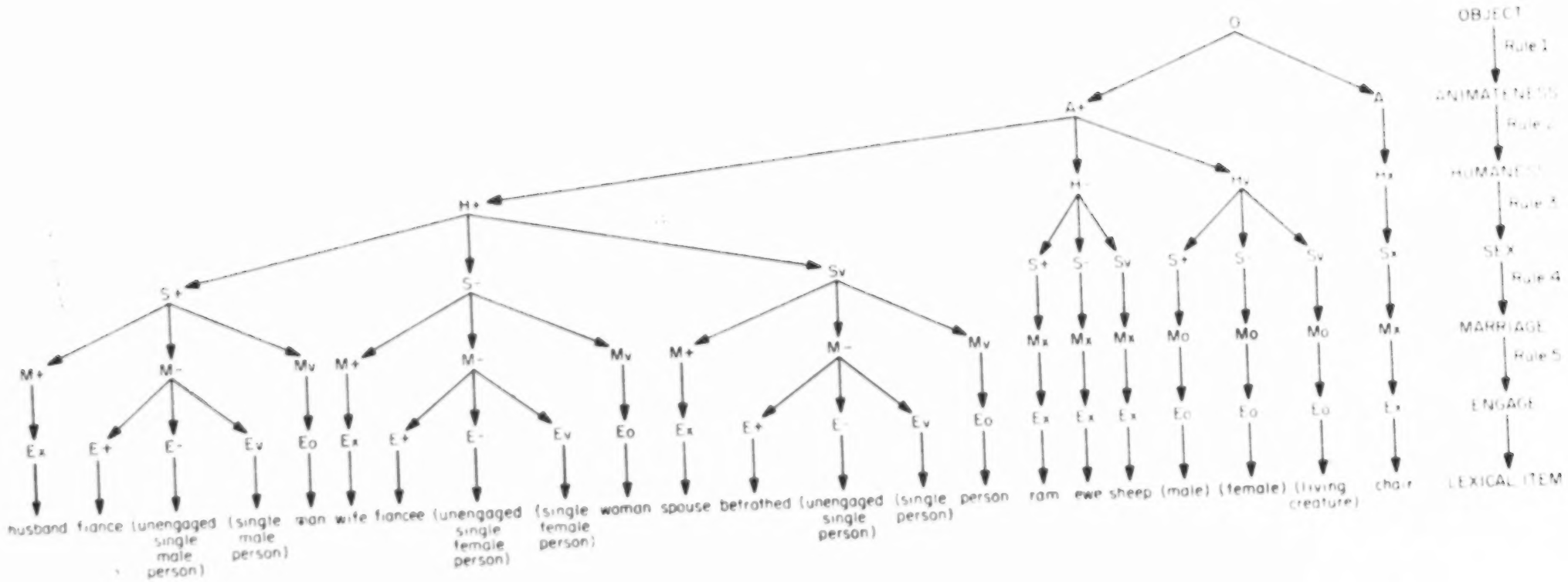
SENTENCE	ANIMATENESS	HUMANNESS	SEX	MARRIAGE	ENGAGE	SEMANTIC TYPE
The fiance (L1)	+	+	+	-	+	If all No News
is a man (L2)	+	+	+	v	0	then
Information Judgment	θ No News	θ No News	θ No News	θ No News	θ No News	REDUNDANT
The man (L1)	+	+	+	v	0	If News and
is a betrothed (L2)	+	+	v	-	+	no Conflict then
Information Judgment	θ No News	θ No News	θ No News	- News	+ News	INFORMATIVE
The man (L1)	+	+	+	v	0	If Conflict and
is a woman (L2)	+	+	-	v	0	0 or 1 Irrelevant then
Information Judgment	θ No News	θ No News	- Conflict	θ No News	θ No News	CONTRADICTORY
The chair (L1)	-	x	x	x	x	If Conflict and
is a sheep (2)	+	-	v	x	x	2 or more Irrelevant then
Information Judgment	+ Conflict	- Irrelevant	v Irrelevant	θ No News	θ No News	AMPHIGOROUS

FIGURE 1

Semantic Feature Codings of Lexical Items

Which Have Been Generated by the Set of Rules Specified in Table 13.

Potential Lexical Items Are Indicated in Parentheses


husband
fiance
(unengaged single male person)
(single male person)
man
wife
fiancee
(unengaged single female person)
(single female person)
woman
spouse
betrothed
(unengaged single person)
(single person)
person
ram
ewe
sheep
(male)
(female)
(living creature)
chair
LEXICAL ITEM